

Hands-On

Power Quality and Harmonics



Course Description

Nearly all electrical devices have power supplies that may cause a disturbance to the current sine wave of a power source. Most published surveys show that 65-85% of the power quality problems are the result of something happening within the facility, on the customer side of the point of common coupling. It may be the wiring or the loads themselves that make the supplied voltage incompatible with equipment within the facility. The result is that the process is interrupted, productivity is halted, and dollars are lost.

This Hands-On course combines extensive field testing and field experience to familiarize attendees with the terminology and concepts to evaluate power quality. The effects of harmonics on various power system components and methods of reducing excessive harmonics will also be addressed. IEEE recommendations, National Electric Code requirements and Canadian Standards Association are also emphasized in this course.

Students Will Learn

- **Power Quality Definitions and Standards**
- **Effects of Poor Power Quality**
- **Describe Various Equipment used for Power Monitoring.**
- **Recognize the Cause and Source of Power System Disturbances.**
- **Explain how to Mitigate any Existing and Potential Problems, Thereby Minimizing Equipment Disoperation and Process Downtime.**
- **Analyze Types of Electrical Systems Loads and their Power Quality Considerations.**
- **Calculate Harmonic Voltages and Currents**
- **Interpreting Power Quality Data**
- **Mitigation Techniques**
- **Identifying, Isolating, and Troubleshooting Power Quality Problems**
- **And More...**

Target Audience

Designed for electricians, technicians and maintenance personnel that are responsible for the identification and correction of power quality and harmonics problems in commercial and industrial environments.

Prerequisites

Requires basic electrical, wiring and math skills. Bring a scientific calculator.

Course Outline

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Module I. Introduction to Power Quality Analysis

- Review of Industrial Power Systems Concepts
- Power Quality Definitions
- Equipment Ratings
- Effects of Disturbances on Equipment and Processes

Module II. Industry Commitment to Power Quality

- IEEE Standards and Recommendations
- EPRI Survey Results

Module III. Harmonics

- Sources of Harmonics
- Symptoms and Effect on Equipment
- Power Factor Capacitors and Resonance
- Harmonic Limitations (IEEE Standard 519)
- Series Resonance and Filter Design
- Third Harmonic Neutral Current

Module IV. Calculation of Harmonic Voltages and Currents

- System Harmonic Models
- The Current Injection Method
- Frequency Response Modeling

Module V. Grounding

- Types of Grounding
- Arcing Ground Faults
- Symptoms of Ineffective Grounding
- Electronics and Computer Grounding

Module VI. Voltage Disturbances

- Lightning
- System Switching
- System Faults

- Sags
- Swells

Module VII. Measurement Techniques

- IEEE Emerald Book -Conducting Site Surveys
- Manufacturers' Terminology
- Grounding Measurements
- Disturbance Measurements
- Waveform Signatures

Module VIII. Mitigation Techniques

- K-Factor Transformers
- Power Line Conditioners

Delivery Method

Instructor-Led with numerous Hands-On labs and exercises.

Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

2 Days